Amendments to the Specification:

Please replace the paragraph at page 3, lines 10-20, with the following amended paragraph:

In one embodiment of the invention, the seal energizer is configured to minimize a non-negative net force against one of the upper element and the lower element above a threshold value. The net force follows the equation [[P1*A1 - P2*A2]] P2*A2 - P1*A1, where [[P1]] P2 equals the sealing pressure, [[P2]] P1 equals the processing pressure, [[A1]] A2 equals a cross-sectional area of the seal-energizing cavity, and [[A2]] A1 equals a cross-sectional area of the processing volume. Preferably, the seal energizer is configured to maintain a difference [[P1 - P2]] P2 - P1 substantially constant during a processing cycle. The seal energizer preferably comprises a first cavity and the seal-energizing cavity. The first cavity is coupled to the seal-energizing cavity. The seal energizer is configured so that a first pressure generated within the first cavity generates a second pressure in the seal-energizing cavity larger than the first pressure. Preferably, the cross-sectional area [[A1]] A2 is larger than the cross-sectional area [[A2]] A1.

Please replace the paragraph at page 3, line 26, to page 4, line 11, with the following amended paragraph:

In a second aspect of the present invention, a method of maintaining a processing volume comprises generating a processing pressure within a processing volume and controlling a sealing pressure to form and maintain a processing volume. During a processing cycle the sealing pressure is varied non-linearly with the processing pressure. Preferably, the sealing pressure is related to the processing pressure by the equation ΔF = [[P1*A1 - P2*A2]] P2*A2 - P1*A1, where [[P1]] P2 equals the sealing pressure, [[P2]] P1 equals the processing pressure, [[A1]] A2 equals a cross-sectional area of a seal-energizing cavity, and [[A2]] A1 equals a cross-sectional area of a processing volume. The sealing pressure is varied to maintain ΔF above a threshold value. A cross-sectional area of the processing volume preferably is smaller than a cross-sectional area of the seal-energizing cavity. The step of generating a processing pressure preferably comprises containing a high-pressure processing fluid in the processing volume. The high-pressure processing fluid can comprise supercritical carbon dioxide. The step of controlling a sealing pressure preferably comprises generating a hydraulic pressure in the seal-energizing cavity.

Please replace the three paragraphs at page 26, line 20, to page 27, line 23, with the following amended paragraphs:

ΔF = [[P1*A1 - P2*A2]] P2*A2 - P1*A1 (1)

ΔF corresponds to the additional force on one side of the plate than on the other side of the plate. When a plate is perfectly counterbalanced, ΔF equals 0. It will be appreciated that when a plate is used to form a processing volume, by counterbalancing the plate (i.e., by keeping ΔF ≥ 0), a processing volume is maintained. When ΔF is larger than 0, the processing volume is maintained using a greater force than is necessary, requiring extra, unneeded energy.

Again referring to Equation (1), when A1 equals A2, ΔF equals [[A1*(P1 - P2)]] A1*(P2 - P1)–that is, when the pressure difference [[P1 - P2]] P2 - P1, ΔP, is constant, ΔF is constant. If ΔP is not constant, then ΔF varies linearly with ΔP. When A1 does not equal A2, then the relationship between ΔF and ΔP is different, a relationship exploited by the present invention. Indeed, it is believed that the net force ΔF is not always proportional to the difference [[P1 - P2]] P2 - P1. Thus, for example, when A1 = 100 in^2, A2 = 200 in^2, [[P1]] P2 =3,000 lb-f/in^2, and [[P2]] P1 =1,600 lb-f/in^2, then the difference in pressure [[(P1-P2)]] (P2-P1) or ΔP = 3,000 lb-f/in^2 - 1,600 lb-f/in^2 = 1,400 psid ("psid" denoting pounds per square inch differential). The net force, ΔF, then equals P2*A2 - P1*A1 = [[1,600]] 3,000 lb-f/in^2 * 200 in^2 - [[3,000]] 1,600 lb-f/in^2 * 100 in^2 = [[20,000]] 1,400 lbf-d ("lbf-d" denoting pound force differential). When, however, P1=2,500 lb-f/in^2 and P2=1,100 lb-f/in^2, so that ΔP does not change (i.e., remains 1,400 psid), ΔF then equals P2*A2 - P1*A1 = 1,100 lb-f/in^2 * 200 in^2 - 2,500 lb-f/in^2 * 100 in^2 = -30,000 lbf-d. Thus, even though ΔP remains constant, when the pressure changes, ΔF can change magnitude and direction. It is believed that in a processing system, such as the processing system 600 in Figure 11, ΔF varies with the pressure within a processing volume (P_{vol}), such as the processing volume 983.

As described below, embodiments of the present invention exploit this relationship to efficiently maintain a processing volume. Using the above example, when P1 increases, ΔF increases. Referring to Figure 11, P1 corresponds to the pressure within the processing volume 983 (P_{vol}) and P2 corresponds to a sealing pressure (P_{seal}). Thus, when P_{vol} increases, and ΔP is kept constant, ΔF unnecessarily increases. ΔF (and thus P_{seal}) can be reduced to conserve energy, while maintaining the processing volume. This non-linear relationship (P_{seal} does not have to

track P_{vol}) of reducing P_{seal} so that ΔF does not unnecessarily increase can be used to reduce the energy input into a processing system used to maintain a processing volume. Energy can be introduced into the processing system at, for example, the input 9444 of the pressure regulator unit 944 of Figure 11.

Please replace the paragraph at page 29, line 19, to page 30, line 1, with the following amended paragraph:

This relationship has two consequences. First, if there is a minimum force necessary to maintain a processing volume (i.e., maintain a processing seal), ΔP must be selected so that at the lowest pressure there is sufficient force to maintain the processing volume. In this case, as the pressure rises, the net force ΔF increases above this minimum level [[(ΔF_{thresh})]] (ΔF_{thresh}^{LOW}), an inefficient process. Instead, the pressure regulator unit 944 can be optimized so that P_{seal} is controlled so that ΔF never exceeds [[ΔF_{thresh}]] (ΔF_{thresh}^{UPP}), thus using the minimum energy to maintain the processing volume. The second consequence is that, if the required sealing force (and thus P_{seal}) increases at a slower rate than the processing force (and thus P_{vol}), then P_{seal} can lag behind P_{vol} and still maintain the processing volume. Thus, the response time of the pressure regulator unit 944 used to generate a sealing force need not be as fast as the changes in processing pressures.

Please replace the two paragraphs at page 30, line 21, to page 31, line 5, with the following amended paragraphs:

Again referring to Figure 11, the pressure regulator unit 944 can be controlled ~~to follow the relationship given~~ in accordance with the present invention to efficiently maintain a processing volume using Equation (1) above to calculate a force differential. For example, the pressure regulator unit 944 can be programmed or coupled to a controller that controls the pressure regulator unit 944 to efficiently vary P_{seal} (and thus the sealing force) in accordance with the present invention. The pressure regulator unit 944 can be programmed to generate a pressure that is ultimately translated into the required P_{seal} and thus translated into the sealing force, as described above.

The pressure regulator unit 944 can also be controlled so that ΔF never falls below a

threshold value, $[[\Delta F_{thresh}]]$ $\underline{(\Delta F_{thresh}^{LOW})}$. $[[\Delta F_{thresh}]]$ $\underline{(\Delta F_{thresh}^{LOW})}$ can correspond, for example, to a force differential that allows for small pressure swings and thus ensures that a processing volume is maintained even if the pressure regulator unit 944 is slow to increase P_{seal} in response to changes in P_{vol}. It will be appreciated that the pressure regulator unit 944 must be configured to switch between pressures quickly enough to constantly maintain the processing volume 983.

Please replace the three paragraphs at page 31, lines 6 to 25, with the following amended paragraphs:

Figure 14 shows sealing steps 1400 in accordance with one embodiment of the present invention. In the first step 1401, the start step, any initialization steps are performed. Referring to Figure 11, in the first step 1401 a wafer is placed on the platen 982 and the processing volume 983 is formed. Other initialization steps can include determining the maximum processing pressure that will be attained within the processing volume 983, calculating other processing parameters, etc. Next, in the step 1402, it is determined whether a minimum force differential $[[(\Delta F_{thresh})]]$ $\underline{(\Delta F_{thresh}^{LOW})}$ is needed to maintain the processing volume 983. If a minimum force differential is necessary, step 1410 is performed; otherwise, step 1405 is performed.

In the step 1410, a minimum force differential is calculated. In the step 1405, $[[\Delta F_{thresh}]]$ $\underline{\Delta F_{thresh}^{LOW}}$ is set to 0 lb-f. It will be appreciated that in the step 1405, the $[[\Delta F_{thresh}]]$ $\underline{\Delta F_{thresh}^{LOW}}$ can be set to another value appropriate for the circumstances. After either the step 1410 or the step 1405, the step 1415 is performed.

In the step 1415, a wafer is processed within the processing volume 983. Next, in the step 1420, P_{vol} and P_{seal} are read and P_{seal} is varied to maintain the processing volume 983. In accordance with one embodiment of the present invention, P_{seal} is varied in accordance with the present invention ~~Equation (1) above~~ to efficiently maintain the processing volume 983. That is, P_{seal} can be set to lag P_{vol} and still maintain the processing volume 983 by ensuring that $\Delta F >$ $[[\Delta F_{thresh}]]$ $\underline{\Delta F_{thresh}^{LOW}}$. It will be appreciated that while, for simplicity, Figure 14 shows the step 1420 being performed after the step 1415, it will be appreciated that the step 1420 will be performed during the step 1415, that is, while a wafer is being processed.

Please replace the Abstract, at page 36, lines 1-11, with the following amended paragraph:

A processing chamber having an improved sealing means is disclosed. The processing chamber comprises a lower element, an upper element, and a seal energizer. The seal energizer is configured to maintain the upper element against the lower element to maintain a processing volume. The seal energizer is further configured to generate a sealing pressure in a seal-energizing cavity that varies non-linearly with a processing pressure generated within the processing volume. In one embodiment, the seal energizer is configured to minimize a non-negative net force against one of the upper element and the lower element above a threshold value. The net force follows the equation [[P1*A1 - P2*A2]] <u>P2*A2 - P1*A1</u>, where [[P1]] <u>P2</u> equals the sealing pressure, [[P2]] <u>P1</u> equals the processing pressure, [[A1]] <u>A2</u> equals a cross-sectional area of the seal-energizing cavity, and [[A2]] <u>A1</u> equals a cross-sectional area of the processing volume.